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XVIII.—*Notes on the Family Cathypnidæ.*

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(Read April 16, 1913.)

PLATES XXII AND XXIII.

DURING this year I have published reports on the Cathypnidæ of South America and of Australasia in this Journal. Descriptions were given of about 30 species, many of them previously undescribed (35), (36).*

* The figures in brackets refer to the Bibliography at the end of the paper.

EXPLANATION OF PLATE XXII.

- Fig. 1. —*Cathypna lofuana* sp. n.
2a.—*C. papuana* sp. n. Dorsal view.
2b. Ditto. Lateral view.
2c. Ditto. Side of toe.
2d. Ditto. Toe, dorsal.
3. —*C. mira* sp. n. Dorsal view.
4a.—*C. ploenensis*. Dorsal view.
4b. Ditto. Ventral view.
5. —*C. sulcata* (?). Dorsal view.
6. —*C. clara*. Fully extended.
7a.—*C. inermis*. Dorsal view.
7b. Ditto. Foot.
8a.—*C. brevis* sp. n. Dorsal view.
8b. Ditto. Foot.
9. —*Monostyla falcata* sp. n. Dorsal view.
10. —*M. constricta* sp. n. Dorsal view.
11a.—*M. turbo* sp. n. Dorsal view.
11b. Ditto. Ventral view.
11c. Ditto. Lateral view.
11d. Ditto. Optical section.
11e. Ditto. Toe.

(All figures magnified 260 diam.)

Dec. 17th, 1913

Mr. Rousselet suggested that I might supplement this work by a monographic study of the family. Time and circumstances made this impossible, and it was decided to contribute what I could to the knowledge of the group by publishing figures of all the species I had seen, apart from those illustrated in the two papers above mentioned. These amounted to about a score of species, so that in the three papers, including the present one, fifty species of the family are illustrated and described. Twenty-two of these are species previously undescribed.

A critical list which I have made of the species in this family, from which I exclude all names which are certainly synonyms and all which are insufficiently described, contains only sixty-seven species, including all my new species. Some half-dozen or more of those in this list are almost certainly unrecognizable, though I have not felt justified in excluding them, as they possess sufficiently distinct characters if we could have confidence in the observations.

In describing some of the new species, it is quite likely that I have had under observation animals previously described, but if so, described in such a manner that it is impossible to detect the identity.

Some species have been described without accompanying figures. All of these I reject without hesitation, as I consider it quite impossible to make a description of a species which shall serve for certain identification without the assistance of a figure. The figure is the important thing; the written description merely an explanation of the figure, calling attention to characters which might be overlooked.

We are all aware how defective many drawings of new species are. It would be easy to give instances of works in which the descriptions and figures are mutually contradictory, but at any rate, when a figure is given you have something with which you can compare the animal you are observing, and if you find them to be quite different you should be safe in assuming that your animal is distinct.

Allowance must be made for the earliest observers, when Microscopes were primitive, and it was not suspected that species were so numerous as to need careful discrimination. Such allowance has been made in establishing a number of the Müllerian and Ehrenbergian species, which could not be certainly identified from the simple outlines given. These pioneers were conscientious observers.

Surely moderns need not claim such indulgence now that Microscopes have improved so greatly, and they ought to know that close observation is necessary. If a man can neither observe carefully, nor describe faithfully, nor draw accurately, surely he might leave the poor beasts alone.

It is undoubtedly the case that with the great increase in the

number of species in almost all families of Rotifers, much closer observation is necessary than was formerly the case. I do not mean to say that I, for my part, would distinguish species on narrower differences, but that, by closer examination, minute but good characters are detected which are readily overlooked by anyone not a specialist.

In short, it is necessary to specialize in certain groups if one is to identify species with certainty. Even in the Cathypnidæ, which is not one of the largest families, it requires a great deal of study before one is qualified to identify the sixty odd species, besides taking into account the forty odd synonyms and rejected species.

The main object of this paper is to describe all the species I have observed, and not previously described by me. In these three papers in the Journal we have about fifty species of Cathypnidæ all observed by the same pair of eyes, and all drawn (a very important point) to the same scale.

I would have liked to give some sort of key to the species, but that would be rather a difficult matter, requiring more sifting of material than I have time for.

A great proportion of the material used in preparing this paper has been drawn from Mr. Rousselet's collection. This paper should properly have been written by him, but that he would not undertake it.

With his usual kindness, Mr. Rousselet turned over to me all the Cathypnidæ in his collection to do what I would with, and he has throughout given me the benefit of his critical opinion on specific values.

In the collection I found a good number of unknown species, which are here described, some of them having no known habitat except "the Rousselet collection," specimens having reached Mr. Rousselet without data of localities, or having lost their labels.

The finding of these species in the collection was not merely a lucky chance for me. They were there because Mr. Rousselet knew enough about the Cathypnidæ to see that the animals looked different from the species he knew, and so to isolate and mount them.

I have also to thank Mr. Bryce for sending to me a number of the original specimens of his new species, and for critical advice about specific values in a family he knows well.

Mr. Harring, of Washington, has assisted with advice and bibliographical references, and I have seen many of his American specimens by favour of Bryce and Rousselet.

SPECIFIC CHARACTERS.

I have no intention to consider the structure of the Cathypnidæ, except in so far as is necessary for the identification of species. I know of no case in which there is anything characteristic in the

internal structures, and I have omitted these details from all drawings, as they would only obscure the structure of the lorica, in which all specific distinctions are found.

The lorica, into which the head can be completely retracted, consists of a dorsal and ventral plate, connected by a flexible membrane, and a posterior prolongation usually supposed to be part of the ventral plate, but which I believe to be really the dorsal plate of a second segment. The lateral view (see figs. 2*b* and 13*b*) always confirms this theory of the relation of parts.

The anterior margin of the lorica, which can only be seen when the head is retracted, affords one of the best and most constant specific characters, and therefore for systematic purposes the animals are always represented fully contracted.

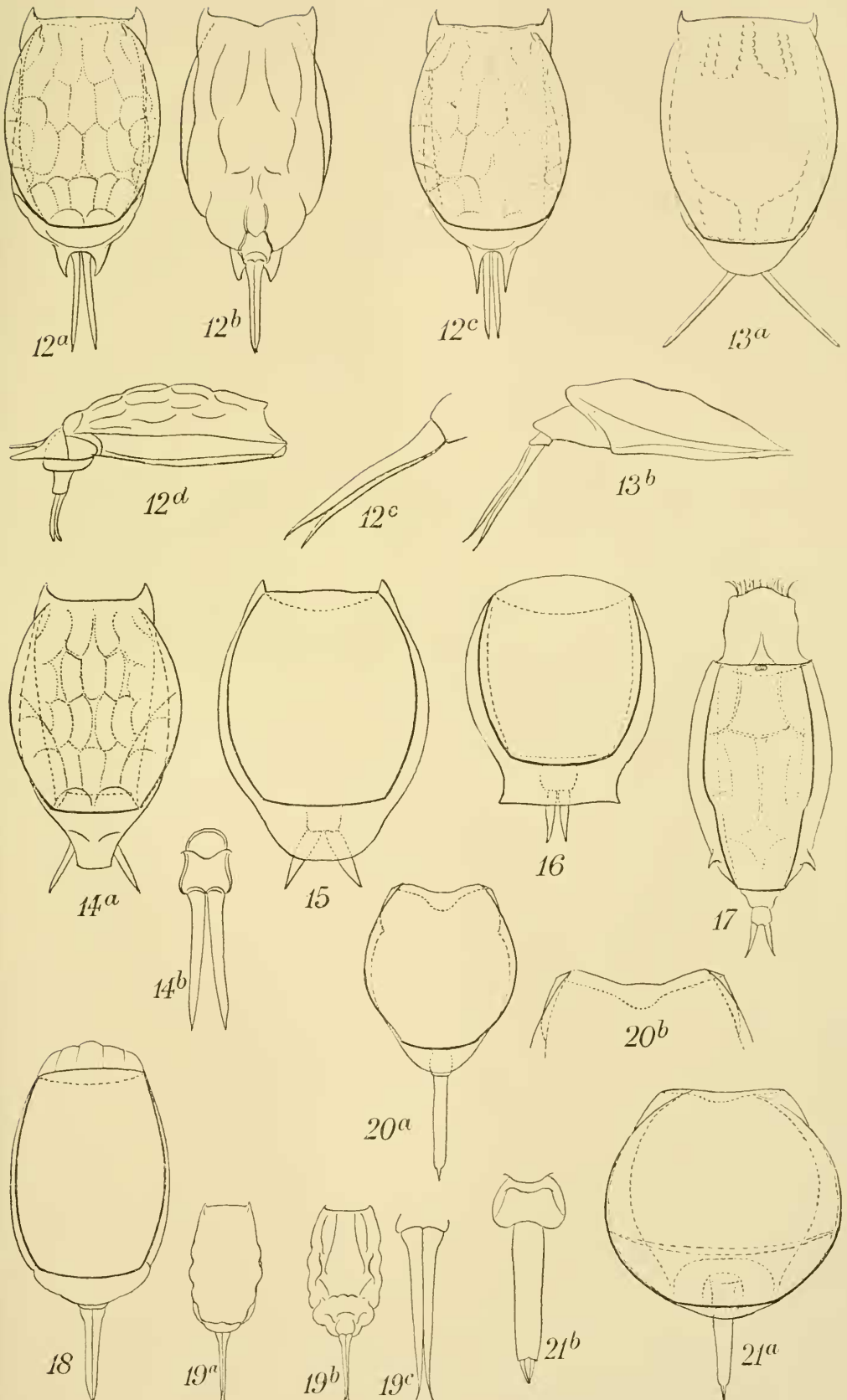
Cathypna lofuana (fig. 1) is the most suitable figure to illustrate the structure of the lorica. The dorsal plate, which in this species is narrower than the ventral, is indicated by a darker line. Its posterior border is almost invariably a very flat convex, rarely more rounded (figs. 6, 8, 9). The lateral margin is sharply defined till it approaches the anterior margin. Sometimes it can be traced clearly to the anterior margin (figs. 3, 15, 17, etc.), but often, as in *C. lofuana*, it is bent or curved inwards and disappears before reaching the anterior margin. It is a problem I offer to students to determine the anterior limits of the dorsal plate in such cases.

The ventral plate terminates anteriorly in angles, rarely rounded off (figs. 11, 16, etc.), often produced as little spines

EXPLANATION OF PLATE XXIII.

- Fig. 12*a*.—*Cathypna stokesii*. English form; dorsal view.
 „ 12*b*. Ditto. English form; ventral view.
 „ 12*c*. Ditto. American form; dorsal view.
 „ 12*d*. Ditto. Lateral view.
 „ 12*e*. Ditto. Lateral view of toes.
 „ 13*a*.—*C. signifera*. Dorsal view.
 „ 13*b*. Ditto. Lateral view.
 „ 14*a*.—*C. ohioensis*. Dorsal view.
 „ 14*b*. Ditto. Toes.
 „ 15. —*C. brachydactyla*. Dorsal view.
 „ 16. —*C. ligona*.
 „ 17. —*C. spinifera*.
 „ 18. —*C. depressa*.
 „ 19*a*.—*C. muscicola*. Dorsal view.
 „ 19*b*. Ditto. Ventral view.
 „ 19*c*. Ditto. Toes.
 „ 20*a*.—*Monostyla* sp. (?)
 „ 20*b*. Ditto. Front of lorica more enlarged.
 „ 21*a*.—*M. robusta*. Dorsal view.
 „ 21*b*.— Ditto. Toe.

(All figures magnified 260 diam.)



(figs. 1, 8a, 12, 13, etc.). The dorsal plate rarely also terminates anteriorly in angles or spines (*C. luna*, *M. lunaris*, *M. hamata*, etc.).

The membrane connecting the two plates is usually folded in, making the lateral and posterior sulci (indicated in fig. 1 by dotted lines). A line can be seen running upwards and outwards from the posterior angles of the dorsal plate to the ventral plate. I believe that the ventral plate proper ends at this line.

The ventral plate, as thus defined, is always shorter than the dorsal; that is to say, the dorsal projects farther back.

Some species have no sulcus, the membrane not being folded in, but passing straight across from plate to plate (*C. hastata*, *M. bulla*).

The posterior prolongation, which is seen in almost all the figures as a rounded lobe between the end of the dorsal plate and the toes, is the part that Gosse refers to as a "shelly boss." I refer to it provisionally simply as the "posterior lobe." Gosse suggests that this part may be the basal joint of the foot, which seems likely enough when we consider the lateral views.

Underneath this boss is a smaller part, usually considered to be the whole of the foot. It appears to consist of one or two short joints. It bears the toe or toes, which are longer or shorter, straight or curved, shouldered or not.

The dorsal plate is either quite plain on the surface, or more or less wrinkled or faceted. The faceting is always symmetrical, and is constant for each species. The commonest pattern is that shown in the figure of *C. ohioensis* (fig. 14a). The central markings are irregular hexagons, those towards the margins more obscure.

Other patterns of facets are found in *C. mira* (fig. 3), *C. nitida*, *C. signifera* (fig. 13a), *C. spinifera* (fig. 17), etc. Some are simply sulcate dorsally (figs. 5, 6, 9, etc.), some are wrinkled (*C. flexilis*, etc.). *M. turbo* (fig. 11a) has peculiar transverse wrinkles.

The ventral plate has always some wrinkles, usually characteristic for each species.

In describing a species the chief points to be noted are—the general form; relative width of dorsal and ventral plates; depth of sulcus; form of anterior margins, dorsal and ventral if different, and if bounded by spines; anterior termination of dorsal lateral margin; faceting or not of dorsal plate; form and prominence of posterior lobe; form of toes, if straight or curved, tapering, shouldered, or clawed; depth of lorica dorso-ventrally.

The principal dimensions which should be taken are—total length of contracted lorica, length of dorsal plate, length of toe, breadth of dorsal plate, ventral plate, and of anterior border, angle to angle.

The dorsal and ventral anterior margins should be distinguished when they differ. What appears to be the dorsal anterior margin usually consists largely of the edge of the connecting membrane.

It is very general in the family for the dorsal plate to be narrower than the ventral at its extreme front, although it may be wider below (see figs. 2, 3, 10, etc.). I only know a few species in which the dorsal plate is wider in front than the ventral—*M. obtusa*, *M. turbo* (fig. 11a), *C. sulcata* (fig. 5). In *C. ploenensis* the plates are exactly equal in front.

A careful drawing should accompany every description of a new species.

LIST OF SPECIES STUDIED.

BRITAIN.

<i>Cathypna stokesii</i> Pell.	<i>C. inermis</i> Bryce.
<i>C. ploenensis</i> Voigt.	<i>C. muscicola</i> Bryce.
<i>C. hornemanni</i> Ehr.	<i>C. brevis</i> sp. n.
<i>C. ligona</i> Dunlop.	<i>C. spinifera</i> Western.
<i>C. sulcata</i> Gosse.	<i>Monostyla closterocerca</i> Schimarda.
<i>C. depressa</i> Bryce.	<i>M. falcata</i> sp. n.
<i>C. clara</i> Bryce.	<i>M. turbo</i> sp. n.

GERMANY.

Monostyla constricta sp. n.

AFRICA.

Cathypna lofuana sp. n. Lofu River, Tanganyika.

INDIA.

Monostyla cochlearis Murray. *M. asymmetrica* Murray.

NEW GUINEA.

Cathypna papuana sp. n.

UNITED STATES.

<i>Cathypna signifera</i> Jennings.	<i>C. stokesii</i> Pell.
<i>C. ohioensis</i> Herrick.	<i>Monostyla robusta</i> Stokes.

LOCALITY UNKNOWN.

<i>Cathypna mira</i> sp. n.	In Rousselet's Collection.
<i>C. brevis</i> sp. n.	Ditto.

Note.—All figures in the Plates accompanying this paper have been drawn on a uniform scale (excepting some enlargements of the toes to show details) and then reduced by photography to a magnification of 250.

Cathypna lofuana sp. n. Plate XXII, fig. 1.

Specific Characters.—Large, oblong; dorsal plate narrower, truncate behind. Anterior margins shallowly excavate, with small lateral spines. Posterior lobe of lorica trefoliate. Lateral margin of dorsal plate abruptly bent near the anterior border, not reaching to it. Toes about half the length of lorica, tapering, with sharp shoulder and short claw. Lateral and posterior sulci deep.

Description.—Length of contracted lorica $150\ \mu$, of dorsal plate $120\ \mu$, of toe $65\ \mu$; breadth of dorsal plate $105\ \mu$, of ventral plate $115\ \mu$, of anterior border $80\ \mu$.

The ventral plate is widest in the middle, the dorsal nearer the front. The anterior border shows at each side a sigmoid curve reaching to near the median line, and in the middle a short convex piece.

C. lofuana has most resemblance to *C. luna* and *C. curvicornis*. *C. luna* has the dorsal plate wider, and is more deeply excavate in front. *C. curvicornis* has longer toes, with obscure shoulder and claw. The 3-lobed posterior end of the lorica and the peculiar abrupt inbending of the margin of the dorsal plate in front suffice to distinguish this species from all others.

Habitat.—The Lofu River, Lake Tanganyika. Collected on the third Tanganyika Expedition, under Dr. Cunningham, 1904–1905. I found the specimen, unnamed, in the collection of Mr. Rousselet, who kindly placed it at my disposal.

Cathypna papuana sp. n. Plate XXII, figs. 2a–2d.

Specific Characters.—Short and round, truncate in front. Dorsal plate nearly circular, truncate both ends. Ventral slightly narrower. Dorsal anterior margin slightly excavate and undulate; ventral elevated above dorsal except in the middle, where there is a deep incision. Sulcus moderate, posterior lobe short, rounded. Toes short, with shoulder and claw, the shoulder bearing a small spine.

Description.—Length of contracted lorica $105\ \mu$, of dorsal plate $95\ \mu$, of toe $50\ \mu$; breadth of dorsal plate $100\ \mu$, of ventral plate $92\ \mu$, of anterior margin $80\ \mu$.

The ventral plate is oblong, and very little diminished in front, making a very wide anterior border. The dorsal lateral margin is evenly rounded in front, and can be traced almost to the anterior border.

C. papuana is very similar to *C. luna*, but has a quite different anterior border, wider, less excavate, and of peculiar outline. It is smaller, and relatively shorter and broader.

Habitat.—New Guinea. Placed at my disposal by Mr. Rousselet.

C. ploenensis Voigt (50). Plate XXII, figs. 4a-4b.

Syn. *Distyla ploenensis* Voigt.

Description.—Large, oblong, dorsal plate broader, posterior border narrow. Posterior lobe small, rounded. Anterior border straight, bounded by small spines. Toes half length of lorica, from broad base suddenly narrowed and near the points more rapidly tapered. Lateral sulcus shallow, posterior deep. Dorsal plate faceted.

Length of contracted lorica $135\ \mu$, of dorsal plate $125\ \mu$, of toe $65\ \mu$; breadth of dorsal plate $90\ \mu$, of ventral plate $80\ \mu$, of anterior border $65\ \mu$.

The dorsal plate is of the same width as the ventral in front, so that the frontal spines belong to both. The dorsal facets form the pattern commonest in the order, as in *C. stokesii*, *C. ohioensis*, etc., but the proportions are peculiar, some of the anterior and posterior facets being elongated at the expense of the middle ones.

Habitat.—Scotland.

C. signifera Jennings (26). Plate XXIII, figs 13a, 13b.

Description.—Fairly large. Dorsal plate broader. Anterior margin flatly convex, between small curved spines. Posterior lobe prominent. Toes long, slender, straight, acute, not shouldered. Dorsal plate faceted, the facets bordered by large papillæ.

Length of contracted lorica $130\ \mu$, of dorsal plate $110\ \mu$, of toe $55\ \mu$; breadth of dorsal plate $85\ \mu$, of ventral plate $75\ \mu$, of anterior border $65\ \mu$.

The facets appear to form a distinctive pattern, distinct from that of *C. stokesii* or *C. mira*, but I could not distinguish any except those near the anterior and posterior borders. The papillæ also occur on the ventral surface, following the lines of the wrinkles.

Drawn from a specimen collected by Mr. Harring, and given to me by Mr. Rousselet.

Cathypna ohioensis Herrick (22). Plate XXIII, figs. 14a, 14b.

Description.—Of medium size, ovate, produced behind into truncate process. Dorsal plate wider, tessellated. Anterior margins straight, bounded by conspicuous spines. Toes short.

Length of contracted lorica $135\ \mu$, of dorsal plate $100\ \mu$, of toe $35\ \mu$; breadth of dorsal plate $80\ \mu$, of ventral plate $70\ \mu$, of anterior margin $45\ \mu$.

The dorsal margin cannot be traced quite to the front. The

tessellation is on the same general plan as that of *C. stokesii*, *C. ploenensis*, etc. The toes are slender, slightly enlarged at base, hardly tapering except near the acute points.

Studied from specimen in Mr. Rousselet's collection.

Cathypna stokesii Pell (38). Plate XXIII, figs. 12a-12e.

Description.—Of medium size, oval. Dorsal plate broader, tessellated, anterior margin convex, between prominent spines, ventral margin excavate in a flat V. Posterior lobe produced into a forked process; toes slender, of moderate length.

Length of contracted lorica 125-135 μ , of dorsal plate 100 μ , of toe 45 μ ; breadth of dorsal plate 75 μ , of ventral plate 65 μ , of anterior border 50 μ .

The faceting is of the pattern commonest in the family, as in *C. ploenensis* (fig. 4a), *C. ohioensis* (fig. 14a), etc. The anterior margin is nearly straight, flatly convex (fig. 12a), or broken into three short convex sections (fig. 12c). The toe is expanded at the base, then scarcely tapering till near the acute point.

The American form (fig. 12c), has the posterior processes straight and acute. The English form (fig. 12a) has them slightly incurved, shorter, and less acute. I can see no other differences between the two.

I have drawn the American variety from specimens in Mr. Rousselet's collection, the English form from a specimen given me by Mr. Stevens of Exeter, who discovered it in this country.

Cathypna mira sp. n. Plate XXII, fig. 3.

Specific Characters.—Of medium size, pyriform. Dorsal plate broader, oval, truncate at both ends, the lateral border reaching to frontal margin, but curved downwards again. Anterior margin straight, between short broad spines. Posterior lobe of lorica very prominent. Toes short, shouldered and clawed. Faintly faceted dorsally on an unusual pattern, and punctate.

Description.—Length of contracted lorica 130 μ , of dorsal plate 100 μ , of toe 85 μ ; breadth of dorsal plate 94 μ , of ventral plate 80 μ , of anterior border 60 μ .

The dorsal margin is very unusual in merely touching the anterior edge and curving away from it again. The pattern of the dorsal faceting is quite peculiar, having median facets where other species, such as *C. ploenensis* (see fig. 4a), have pairs, and vice versa. The facets are almost flat, not separated by ridges. The anterior spines are broad, with a sigmoid curvature on the inner side. In the figure the dots are shown only on a few of the facets, in order not to obscure the pattern.

Habitat.—Unknown. Several slides of the species are in Mr. Rousselet's collection, without the localities noted.*

Cathypna brachydactyla Stenroos (45). Plate XXIII, fig. 15.

Description.—Fairly large, somewhat rhomboid. Dorsal plate narrower than ventral. Anterior border straight, bounded by small spines. Posterior lobe very prominent. Toes short, broad, tapering, acute.

Length of contracted lorica $135\ \mu$, of dorsal plate $105\ \mu$, of toe $30\ \mu$; breadth of dorsal plate $90\ \mu$, of ventral plate $100\ \mu$, of anterior border $55\ \mu$.

Drawn from specimen in Mr. Rousselet's collection, found in material collected by Mr. Lucks, near Danzig.

Cathypna ligona Dunlop (12). Plate XXIII, fig. 16.

Description.—Of moderate size. Dorsal plate much narrower than ventral, truncate both ends. Sulci shallow. Posterior lobe a broad hyaline process, with almost straight posterior border. Toes short.

Length of lorica $110\ \mu$, of dorsal plate $90\ \mu$, of toe $25\ \mu$; breadth of dorsal plate $78\ \mu$, of ventral plate $90\ \mu$, of anterior border $68\ \mu$, of posterior process $60\ \mu$.

Habitat.—Fort Augustus, Scotland; drawn from specimen in Mr. Rousselet's collection. (Received from Mr. Dunlop, Greenock.) As the animal had died extended I cannot show the contracted form of the anterior margin.

Cathypna spinifera Western (51). Plate XXIII, fig. 17.

Description.—Of moderate size, elongate. Dorsal plate much narrower than ventral, faceted, truncate both ends. Anterior margins nearly straight. Posterior lobe small, narrow, truncate. Toes very short, tapering, acute. Lateral sulcus moderately deep.

Length of lorica $120\ \mu$, of dorsal plate $110\ \mu$, of toe $15\ \mu$; breadth of dorsal plate $55\ \mu$, of ventral plate $70\ \mu$, of anterior border $50\ \mu$.

Two recurved prickles near posterior end of membrane. The dorsal facets are few and large, quite unlike those of other species.

The figure is drawn from a specimen in Mr. Rousselet's collection. The species has been well described, and illustrated by good figures by Mr. Dixon-Nuttall. My figure is here reproduced in order to show all the species to one uniform scale.

* Since writing this paper I have seen abundance of specimens in Mr. Harring's collection in Washington, so that it is likely that Mr. Rousselet's examples emanated from this source.

Cathypna depressa Bryce (3). Plate XXIII, fig. 18.

Syn. *Distyla depressa* Bryce.

Description.—Of moderate size, oblong. Dorsal plate slightly narrower. Anterior margins nearly straight. Posterior lobe broad, obscurely three-lobed. Toe short, from broadish base abruptly contracted, then tapering to near point, then drawn out to fine point.

Length of lorica $115\ \mu$, of dorsal plate $100\ \mu$, of toe $45\ \mu$; breadth of dorsal plate $70\ \mu$, of ventral plate $75\ \mu$, of anterior border $50\ \mu$.

This meagre description is taken from a specimen lent to me by Mr. Bryce. It had died partly extended, so that I could not see the frontal spines which Mr. Bryce noted. In front of the lorica can be seen the hyaline plates which protect the head, as I have figured them in *C. leontina*.

As the specimen could not be turned I was unable to see the principal specific character—the great dorso-ventral flattening.

Cathypna brevis sp. n. Plate XXII, figs. 8a, 8b.

Specific Characters.—Very small, shortly pyriform. Dorsal plate wider, faceted, roundish, truncate in front. Anterior border convex, between small sharp incurved spines. Toes widely divergent, curved, tapering, shouldered and clawed.

Description.—Length of contracted lorica $70\ \mu$, of dorsal plate $60\ \mu$, of toe $20\ \mu$; breadth of dorsal plate $65\ \mu$, of anterior border $55\ \mu$.

The dorsal outline shows undulations which are due to faceting, but that can only be faintly seen in front. The two frontal margins coincide. The posterior lobe is short and broad. The toes are abruptly bent outwards a little way from the base, then curved backwards. The shoulder of the toe sometimes appears double, sometimes single, and on the inner side.

Habitat.—Scotland; and without locality in Mr. Rousselet's collection.

Cathypna muscicola Bryce (3). Plate XXIII, figs. 19a–19c.

Syn. *Distyla muscicola* Bryce.

Description.—Very small, narrowly oval. Dorsal and ventral plates of equal width, both with undulate outlines. Anterior margins nearly straight, between minute spines. Posterior dorsal border undulate; posterior lobe short, rounded. Toe relatively long, from broad short base tapering to very slender points.

Length of contracted lorica $62\ \mu$, of dorsal plate $55\ \mu$, of toe $30\ \mu$; breadth of dorsal plate $35\ \mu$, of anterior margin $22\ \mu$.

The undulate margins should indicate faceting, but I cannot see that on the surface. As in *C. ploenensis* the two plates exactly coincide in front. There are characteristic wrinkles on the ventral plate (fig. 19b).

Habitat.—In Mr. Rousselet's collection.

Cathypna clara Bryce (5). Plate XXII, fig. 6.

Syn. *Distyla clara* Bryce.

Description.—Small, lorica bottle-shaped, with a shortly oval trunk and a smaller frontal portion separated by a neck, rounded behind. Dorsal plate much wider, longitudinally sulcate. Posterior lobe short, rounded. Toes short, tapering, curved.

Length of lorica $90\ \mu$, of dorsal plate $83\ \mu$, of toe $25\ \mu$; breadth of dorsal plate $55\ \mu$, of ventral plate $40\ \mu$, of frontal margin $35\ \mu$.

Studied from a fully-extended specimen. The separation of part of the lorica, apart from the head, is a unique character. The ventral plate has a constriction behind the middle.

How far the characters of this specimen are individual, and due to its condition, I cannot tell. It seems like an animal in its proper shape, but Mr. Bryce's figures, drawn from the living animal, do not show the constriction.

Habitat.—In Mr. Rousselet's collection; one of Mr. Bryce's specimens.

Cathypna inermis Bryce (5). Plate XXII, figs. 7a, 7b.

Syn. *Distyla inermis* Bryce.

Description.—Small and very narrow; dorsal plate much narrower than ventral, widest in front, truncate both ends. Ventral plate parallel-sided for two-thirds of length, diminishing to front. Posterior lobe very prominent, round. Toes short, parallel-sided half-way, rapidly tapering to very long slender points.

Length of lorica $75\ \mu$, of dorsal plate $62\ \mu$, of toe $25\ \mu$; breadth of dorsal plate $22\ \mu$, of ventral plate $33\ \mu$, of anterior margin of lorica $20\ \mu$.

Studied from a fully-extended specimen; it is not fairly comparable with other contracted species. It is evidently a very distinct species, with its long narrow dorsal plate, prominent posterior lobe, and long pointed toes.

It is a difficult animal to interpret, being apparently soft and flexible in life. It was after considerable difficulty that I arrived at an understanding of the dorsal plate, and of its relation to the

posterior lobe. The latter is large, and separated by a deep constriction from the trunk. There is a "hood" as in *M. galeata*, etc.

Habitat.—In Mr. Rousselet's collection. Probably one of Mr. Bryce's original specimens.

Cathypna sulcata Gosse (23). Plate XXII, fig. 5.

Description.—Small, shortly oval, truncate in front. Dorsal plate much broader than ventral, even at extreme front, longitudinally sulcate. Toes short, tapering, acute.

Length of contracted lorica 80μ , of dorsal plate 70μ , of toe 32μ ; breadth of dorsal plate 70μ , of ventral plate 45μ , of frontal margin 50μ .

This is a very doubtful identification, made on the strength of the longitudinal sulci and narrow ventral plate. Gosse shows minute frontal spines and toes, not tapering. His representations of toes in this family are, however, unreliable, as, for instance, in the figure of *M. lunaris*.

Habitat.—Top of Ronas Hill, Shetland.

Monostyla constricta sp. n. Plate XXII, fig. 10.

Specific Characters.—Fairly large, roundish; dorsal plate broader in middle than ventral, much incurved in front, truncate behind. Ventral plate much constricted anteriorly; anterior margin deeply excavate between sharp angles, trefoliate, the sulci deep; posterior lobe scarcely projecting beyond dorsal plate; toe long, tapering, obtusely shouldered and clawed.

Description.—Length of contracted lorica 125μ , of dorsal plate 110μ , of toe 80μ ; breadth of dorsal plate 105μ , of ventral plate 95μ , of anterior margin 40μ .

The dorsal plate is ovate, truncate behind. The margin is incurved in front to an unusual degree, reaching far towards the middle line. It cannot be traced quite to the frontal margin, but the points separating the three curves of the trefoliate excavation undoubtedly mark the limits of the dorsal plate. The sulci are very deep, especially the posterior one. The toe is somewhat narrow.

The species is related to *M. lunaris*, but is distinguished by the much constricted front, less prominent posterior lobe, and longer toe. Two long-toed species discovered by Mr. Harring have wider, less excavate anterior margins, and still longer toes.

Habitat.—Dantzig, from specimen in Mr. Rousselet's collection.

Monostyla robusta Stokes (47). Plate XXIII, figs. 21a–21b.

Description.—Large, round. Dorsal plate slightly larger in middle, very narrow in front. Anterior margins shallowly ex-

cavated, ventral somewhat deeper. Sulcus very deep. Posterior lobe very small. Toe short, broad, gently tapering, shouldered, two-clawed.

Length of contracted lorica $110\ \mu$, of dorsal plate $100\ \mu$, of toe $45\ \mu$; breadth of dorsal plate $115\ \mu$, of anterior margin $60\ \mu$.

The anterior angles are obtuse. The margin of the dorsal plate reaches almost or quite to the anterior margin, of which only about one-third belongs to the dorsal plate. The lateral sulcus is deep, and the posterior extremely deep. Some examples show the little frontal spines as figured by Stokes, and recalling those of *M. bicornis* Stenroos. They do not appear to be constant, or at any rate they are not always visible. The claw appears clearly double, but I have never seen the parts separated.

Mr. Harring regards *M. robusta* as synonymous with *M. cornuta* Müll., but there are two important differences—the shorter toe, and the nearly straight anterior margins. *M. cornuta* is deeply excavate in front.

Studied from examples in Mr. Rousselet's collection; collected, I believe, by Mr. Harring.

Monostyla turbo sp. n. Plate, XXII, figs. 11a–11e.

Specific Characters.—Small, ovate, truncate in front; dorsal plate much broader; posterior lobe prominent. Toe half the length of lorica, slightly expanded in the middle, obtusely shouldered, clawed.

Description.—Length of contracted lorica $70\ \mu$, of dorsal plate $55\ \mu$, of toe $35\ \mu$; breadth of dorsal plate $65\ \mu$, of ventral plate $50\ \mu$, of anterior margin $45\ \mu$.

The dorsal anterior margin is nearly straight, the external angles very obtuse, and belonging to the dorsal plate, the dorsal plate being here wider in front, a rare condition. The ventral anterior margin projects beyond the dorsal in a rounded prominence at each side; in the middle a shallow excavation.

The ventral plate has a slight constriction near the front. The posterior lobe is prominent and narrow. Near the front of the dorsal plate there are several transverse wrinkles, quite peculiar. The anterior margins are similar to those of *C. papuana* (fig. 2a).

Habitat.—Clare Island, Co. Mayo, Ireland; from slide in Mr. Rousselet's collection; a good many examples.

Monostyla falcata sp. n. Plate XXII, fig. 9.

Specific Characters.—Small, elliptical, rounded behind, truncate in front. Anterior margin shallowly excavate. Toe large, broadest in middle, strongly curved. Back longitudinally sulcate.

Description.—Length of lorica $75\ \mu$, of toe $50\ \mu$; breadth of lorica $65\ \mu$, of anterior border $40\ \mu$, of toe at widest part $12\ \mu$.

The animal was only studied while alive, so I failed to secure many details which can only be seen in the contracted state, such as the form of the ventral plate and of the frontal border. I have noted that the lorica is perfectly hyaline and flexible. The eye is clear and colourless. As it swims the animal rotates on its long axis in the manner of a *Mastigocerca*.

It has been suggested that the curvature of the toe is a deformity, and in view of the possibility I refrained from describing the species earlier. Having now a much wider acquaintance with the family, I see that if we imagine the toe straightened out it would still be quite unlike any known *Monostyla*, and so I venture to describe it, despite the incompleteness of the study.

Habitat.—In a small stream on the island of St. Kilda, 1904; a single example.

Ehrenberg (15) figures a variety of *M. lunaris* having a falcate toe, which may have been this species.

Monostyla sp. (?) Plate XXIII, 20a–20b.

Description.—Smallish, pyriform, moderately excavate in front, more deeply on ventral side; posterior lobe prominent, rounded; dorsal plate broader. Toe of moderate length, shouldered and clawed.

Length of contracted lorica 90 μ , of dorsal plate 80 μ , of toe 50 μ ; breadth of dorsal plate 75 μ , of ventral plate 65 μ , of anterior border 50 μ .

The dorsal anterior excavation is in three straight parts, the ventral in two straight lines with a U in the middle. The dorsal plate is obscurely rhomboid, considerably narrowed at both ends. Ventral plate constricted near the front. Toe rather broad, margin undulate, shoulders rounded, claw short.

The lorica is very like that of a species discovered by Haring, and not yet described, but it has a much longer and more slender toe.

Specimen in Mr. Rousselet's collection.

PROVISIONAL LISTS OF ADMITTED AND
REJECTED SPECIES.

Although it may be impossible at the present moment to pronounce authoritatively upon the values of all the reputed species of Cathypnidæ, it may be of some help to other students of the family if I give my estimate of values after examining the great majority of the species. There are many hopelessly inadequate descriptions, and there are many synonyms about which there can be no manner of doubt. It should clear the ground if these are indicated.

It is no part of my plan to give an exhaustive synonymy of the species. The accepted names are given, the original form of the specific names, when different (in brackets), and the synonyms of the rejected species.

CATHYPNA.

ACCEPTED SPECIES.

(Some doubtful ones are indicated.)

- 1912 *C. aculeata* Jak. (25). (*Distyla aculeata*.) Very close to *C. gissensis*.
 1894 *C. affinis* Lev. (29).
 1892 *C. agilis* Bryce (5). (*Distyla agilis*.)
 1898 *C. brachydactyla* Sten. (45).
 1913 *C. brevis* sp. n. Murray.
 1892 *C. clara* Bryce (5). (*Distyla clara*.)
 1913 *C. curvicornis* Murray (35).
 1891 *C. depressa* Bryce (3). (*Distyla depressa*.)
 1887 *C. diomis* Gosse (20). Very incompletely described.
 1886 *C. flexilis* Gosse (23). (*Distyla flexilis*.)
 1884 *C. gissensis* Eck. (13). (*Distyla gissensis*.)
 1913 *C. grandis* Murray (35).
 1913 *C. hastata* Murray (35).
 1838 *C. hornemanni* Ehr. (15). (*Euchlanis hornemanni*.)
 1892 *C. ichthyoura* Shep. (1). (*Distyla ichthyura*.)
 1892 *C. inermis* Bryce (5). (*Distyla inermis*.)
 1887 *C. latifrons* Gosse (20).
 1892 *C. leontina* Turner (49).
 1901 *C. ligona* Dunlop (12).
 1887 *C. lipara* Gosse (21). (*Distyla lipara*.)
 1913 *C. lofuana* sp. n. Murray.
 1884 *C. ludwigii* Eck. (13). (*Distyla ludwigii*.)
 1776 *C. luna* Müll. (32). (*Cercaria luna*.)
 1885 *C. minnesotensis* Herr. (22). (*Distyla minnesotensis*.)
 1913 *C. mira* sp. n. Murray.
 1891 *C. muscicola* Bryce (3). (*Distyla muscicola*.)
 1913 *C. nana* Murray (35).
 1913 *C. nitida* Murray (35).
 1885 *C. ohioensis* Herr. (22). (*Distyla ohioensis*.)
 1913 *C. papuana* sp. n. Murray.
 1902 *C. ploenensis* Voigt (50). (*Distyla ploenensis*.)
 1896 *C. signifera* Jennings (26). (*Distyla signifera*.)
 1894 *C. spinifera* Western (51). (*Distyla spinifera*.)
 1890 *C. stokesii* Pell. (38).
 1887 *C. striata* Gosse (19). (*Distyla striata*.)
 1886 *C. sulcata* Gosse (23).

REJECTED SPECIES.

- 1908 *C. amban* Stewart (46). = *C. brachydactyla* Sten.
 1894 *C. appendiculata* Lev. (29). = *C. ichthyoura* Shep.
 1901 *C. appendiculata* Dad. (10). (*Distyla appendiculata*)
 = *C. ohioensis* Herrick.
 1905 *C. biloba* Dad. (11). Probably variety of *C. leontina* Turner.
 1905 *C. bisinuata* Dad. (11). Variety of *C. leontina* Turner.
 1903 *C. branchicola* Piov. (39). Unrecognizable without figures.
 1912 *C. carinata* Jak. (25). Insufficiently described.
 1898 *C. flexilis* Sten. (45). Name preoccupied, *Distyla flexilis*
 Gosse.
 1897 *C. glandulosa* Stokes (48). = *C. minnesotensis* Herr.
 1890 *C. gossei* Lord (30). Insufficiently described.
 1890 *C. hudsoni* Lord (30). Insufficiently described.
 1905 *C. incisa* Dad. (11) Probably variety of *C. leontina*,
 Turner.
 1898 *C. macrodactyla* Dad. (9). = *C. leontina* Turner.
 1898 *C. magna* Sten. (45). = *C. minnesotensis* Herr.
 1909 *C. oblonga* Runn. (40). (*Distyla oblonga*) = *Diplax*
trigona.
 1898 *C. oxycauda* Sten. (45). (*Distyla oxycauda*) = *C. lud-*
wigii Eck.
 1886 *C. rusticula* Gosse (23). Probably founded on erroneous
 observation.
 1897 *C. scutaria* Stokes (48). = *C. leontina* Turner.
 1892 *C. spenceri* Shep. (43). Insufficiently described.
 1887 *C. ungulata* Gosse (20). = *C. minnesotensis* Herr.
 1847 *Distyla weissei* Eich. (16). Said to be *Fucularia rein-*
hardti Ehr.

MONOSTYLA.

ADMITTED SPECIES.

- 1913 *M. amazonica* Murray (35).
 1891 *M. arcuata* Bryce (3).
 1913 *M. asymmetrica* Murray (35).
 1913 *M. batillifer* Murray (36).
 1898 *M. bicornis* Sten. (45).
 1892 *M. bifurca* Bryce (5).
 1851 *M. bulla* Gosse (18).
 1859 *M. closterocerca* Schm. (42).
 1913 *M. cochlearis* Murray (35).
 1913 *M. constricta* sp. n. Murray.
 1786 *M. cornuta* Müll. (33). (*Trichoda cornuta*.)

- 1913 *M. decipiens* Murray (35).
 1913 *M. falcata* sp. n. Murray.
 1913 *M. furcata* Murray (35).
 1892 *M. galeata* Bryce (5).
 1896 *M. hamata* Stokes (47).
 1893 *M. lamellata* Dad. (7).
 1831 *M. lunaris* Ehr. (14). (*Lepadella lunaris*).
 1887 *M. mollis* Gosse (20).
 1913 *M. obtusa* Murray (35).
 1859 *M. ophthalmalma* Schm. (42).
 1913 *M. punctata* Murray (35).
 1897 *M. pygmæa* Dad. (8).
 1905 *M. pyriformis* Dad. (11).
 1831 *M. quadridentata* Ehr. (14).
 1896 *M. robusta* Stokes (47).
 1892 *M. truncata* Turner (49).
 1913 *M. turbo* sp. n. Murray.
 1901 *Diarthra monostyla* Dad. (10). If correctly drawn is probably a *Monostyla*.

REJECTED SPECIES.

- 1898 *M. appendiculata* Skor. (44). = *M. lamellata* Dad.
 1897 *M. bicornis* Dad. (8). Probably = *M. quadridentata* Ehr.
 1896 *M. bipes* Stokes (47). = *M. bulla* Gosse.
 1910 *M. diophthalma* Iroso (24). Is not a *Monostyla*.
 1897 *M. incisa* Dad. (8). = *M. bulla* Gosse.
 1886 *M. lordi* Gosse (23). Gosse himself was doubtful about this.
 1859 *M. macrognatha* Schm. (42). Insufficiently described.
 1893 *M. ovata* Forbes (17). Unrecognizable without figures.
 1897 *M. parva* Dad. (8). = *M. pygmæa* Dad. (8) (Harring.)
 1892 *M. quennerstedti* Berg. (2). Is not a *Monostyla*.
 1908 *M. stenroosi* Meiss. (31). (?) = *M. lunaris* (Harring.)
 1892 *M. tentaculata* Cosm. (6). Is a *Metopidia*.
 1859 *Lepadella cornuta* Schm. (42). = *M. quadridentata* Ehr.
 1898 *Notommata monostylæformis* Sten. (45). = *M. bifurca* Bryce.

BIBLIOGRAPHY.

It would be beyond the scope of this paper to give a full bibliography of the Cathypnidæ. This is simply a list of all the works in which all supposed new species are described, with a few other works of use to a beginner. Many names have been bestowed upon species of Cathypnidæ, without the authors having any intention of designating new species thereby. This was especially done